

# Rate of Infections Post- Orthopaedic Surgery: A Review of TSHE Factors

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## ABSTRACT

**Introduction:** With the introduction of antimicrobial prophylaxis regimes in the present era, the incidence of surgical site infection and urinary tract infection following orthopaedic procedures has drastically diminished in recent years. This study was found to identify the risk factors still affecting the post orthopaedic surgery patients causing these postoperative reactions.

**Material and Methods:** A case-control study (50 cases, 50 controls) was conducted to evaluate the risk factors associated with infection after orthopaedic procedures. The risk factors defined were as follows: age, gender, associated medical conditions [rheumatoid arthritis, diabetes mellitus, etc], glucose levels, type of parenteral antibiotic prophylaxis (cefotaxime or vancomycin), and the type of anesthesia administered (general, epidural, spinal).

**Result:** Urinary tract infection was the most frequent post-surgical infection (32 cases) followed by surgical site infection (14 cases). The remaining 4 cases experienced both. Using the multivariable regression model, it was found out that only the type of chemoprophylaxis was statistically significant risk factor.

**Conclusion:** Only the type of chemoprophylaxis used was found to significantly affect the incidence of postoperative infections significantly. Results were found to be specifically skewed towards the use of vancomycin instead of cephalosporin; which was associated with a lower risk of infection.

**Keywords:** Infections, Post- Orthopaedic Surgery, TSHE Factors

## INTRODUCTION

In recent years, with pharmacological advances especially the advent of the latest antibiotic prophylaxis, the world has seen a downfall in the incidence of surgical site infections and urinary tract infections following orthopaedic procedures. The most serious and problematic complication occurring in orthopaedic surgical procedures is surgical site infection with the incidence rate of 1% to 3%.<sup>1</sup> Most of these infections result from direct or airborne contamination at the time of surgery and very few follow a haematogenous seeding of the joint.

The second most common hospital-acquired infection is the urinary tract infection reaching an incidence of 25–28%. Mortality is found to be tripled in patients having UTI and there is evidence of increased metastatic infection around joint replacements.<sup>2</sup> Risk factors associated with surgical site infection include obesity, diabetes mellitus, rheumatoid arthritis, increased American Society of Anesthesiologists (ASA) risk index score<sup>3</sup>, whereas female sex, number of days of urinary catheterization, and inappropriate catheter management seem to affect the risk of UTI.<sup>2</sup>

This study has been designed to elucidate the present scenario surrounding the rate of post orthopaedic infections and to

evaluate its possible interactions with the aforementioned conditions.

## MATERIAL AND METHODS

For the assessment of the various parameters associated with increased risk of development of the infection after an orthopaedic procedure, the present case-control study was taken up. A total of 50 study cases and 50 controls were included in the present study. Ethical approval was taken from the institutional ethical committee and written consent was obtained. It consisted of patients who experienced an infection following orthopaedic surgery while controls were randomly selected among patients who had undergone orthopaedic surgery without a subsequent infection.

A surgical site infection had a discharge, which yielded organisms from the culture of aseptically aspirated fluid or tissue from a swab, by elevating the periosteum, inflammation of joints, positiveness shown by intra-surgical culture. Culture of urine specimen which yielded a colony forming units of more than one lakh per ml (CFU/ml) along with the appearance of signs and symptoms in relation to the urinary tract (dysuria, pain on urination) was included into the category of urinary tract infection. A parenteral antibiotic prophylaxis was begun pre-operatively and continued for a maximum of 48 hours after surgery and for 5–7 days for a potentially infected field. Use of broad spectrum antibiotics was done. All cases and controls had sterile urine culture pre-operatively. A urinary catheter was inserted perioperatively and was left in place from 12 hours up to 72 hours in several cases.

## STATISTICAL ANALYSIS

All the results were analyzed by SPSS software. Continuous variables within cases and controls were compared using the Student t-test. Association between categorical variables was examined by the chi-squared test. The multivariable analysis was conducted using the logistic regression approach. The estimates derived from regression models were in the form of odds ratios (OR), which are presented along with their 95% confidence intervals (CI). The effect of the following factors was examined in multivariable analysis: age, gender, associated medical conditions [rheumatoid arthritis, diabetes mellitus, etc], glucose levels, type of parenteral antibiotic prophylaxis (cefotaxime or

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Variable	Multivariate Analysis		
	OR	(95% CI)	p-value
Age	2.43	(0.89, 1.26)	0.12
Obesity	2.55	(0.92, 4.56)	0.08
ASA Class 1	2.13	(0.76, 3.36)	0.53
ASA Class 2	1.66	(0.76, 3.59)	0.22
ASA Class 3	2.45	(0.45, 4.23)	0.29
Chemoprophylaxis (Cephalosporin)	1.41	(0.29, 0.85)	0.02
Type of anesthesia General	0.85	(0.14, 1.78)	0.56
Type of anesthesia Epidural	0.49	(0.23, 2.57)	0.45
Type of anesthesia Spinal (rax)	1.29	(0.98, 3.53)	0.65

**Table-1:** Multivariate Analysis of factors affecting the rate of incidence of infections post orthopaedic surgery

vancomycin), and the type of anesthesia administered (general, epidural, spinal).

## RESULTS

The current study involved 50 cases and 50 controls treated in the orthopaedic department of Mayo Institute of Medical Sciences Barabanki, U.P., India during a 4 year period (2010–2014). Among cases, 32 developed urinary tract infection, 14 developed surgical site infections, and the remaining 4 cases experienced both.

The cases had a higher mean age at enrollment, were more obese, they were assigned higher ASA score, and they had received mainly cefotaxime as prophylaxis. Following significant predictors were revealed by the univariate logistic regression models of post-operative infection: age, obesity, ASA score, the type of anesthesia and the kind of the chemoprophylactic regimen. However, in multivariable analysis, only the type of chemoprophylaxis retained the statistical significance (Table 1). More specifically, cases were almost 56% less likely (OR: 0.38; 95%) to have received vancomycin as prophylaxis rather than cephalosporin compared with the control population.

## DISCUSSION

Surgical site infection is the most common complication following orthopaedic procedures compared to others. Advances in surgical techniques, improvements in operating room ventilation, and the use of prophylactic chemoprophylaxis have all contributed to the decline in the recent years but they still remain the most serious infection following orthopaedic surgery, especially post-arthroplasty.

In our study, surgical site infection represented the second most frequent infection after orthopaedic procedure.<sup>4</sup> Several risk factors have been related to the incidence of SSI following joint arthroplasty including rheumatoid arthritis<sup>5</sup>, urinary tract infection<sup>4</sup>, the timing of prophylactic administration of antibiotics<sup>6</sup>, diabetes mellitus and obesity (>40 kg/m<sup>2</sup>).<sup>5</sup>

In the present study, after orthopaedic surgeries, a significant prediction of infections were revealed by the univariate analysis for age, obesity, ASA score, and type of medicinal treatment protocol followed. Urinary infection was found to be the most frequent infective complication in orthopaedic surgery. The reported incidence of urinary infection after joint arthroplasty is from 28% to 32.6%.<sup>7</sup>

Observation of urinary retention is common in patients undergoing orthopaedic surgeries and anaesthesia along with neural dysfunction of the bladder and prostatic hypertrophy

(in males) is held responsible for it.<sup>8</sup> Thus, an indwelling Foley catheter or intermittent catheterization is often required.

In the univariate regression model of our analysis, the type of anesthesia and the kind of chemoprophylactic regimen were significant predictors of infection. The above-mentioned results are in accord with findings derived from previous studies.<sup>9</sup>

In multivariable modeling, the type of chemoprophylaxis was the only parameter that retained its statistical significance. We also observed that the use of vancomycin was related to significant lower risk of acquiring infection after an orthopaedic procedure. Other studies have also revealed that antibiotic prophylaxis decreases the incidence of urinary infection by a factor of 1.91.<sup>2</sup>

Suboptimal timing of prophylactic antibiotics was associated with a 3–4 fold increased risk of surgical site infections.<sup>10</sup> In patients undergoing total hip or knee arthroplasty, in comparison with multiple doses of broad spectrum antibiotics, single dose of teicoplanin was found to be more effective as a part of prophylactic therapy<sup>11,12</sup>, a finding which enhances the results of our study.

## CONCLUSION

Urinary tract infection was found to be the most frequent hospital cross-infection after orthopaedic procedure in the present study followed by surgical site infection. Despite of association of numerous factors with the occurrence of post-surgical infections, only the kind of chemoprophylaxis remained a statistically significant predictor in multivariable modeling. More specifically, the use of vancomycin instead of cephalosporin is associated with a lower risk of infection.

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